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## Habitat suitability modelling for sardine in a highly diverse ecosystem: the Mediterranean Sea

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Information integrated from different parts of the Mediterranean was used in order to model the spatial and temporal variability of the distribution grounds of sardine. Acoustic data recorded with a 38-kHz split-beam echosounder from the Aegean Sea (eastern Mediterranean), the Adriatic Sea (central Mediterranean), the Sicily Channel (central Mediterranean), and the Spanish waters (western Mediterranean) were analysed along with satellite environmental and bathymetry data to model the spatial distribution of sardine during summer, autumn, and early winter. Similarly, egg distribution data from the Spanish waters were used to model the potential spawning habitat of sardine during early winter. Satellite data were used as proxies to infer spatial variations of environmental factors and assess possible ecological relationships. Generalized additive models (GAMs) have been applied in a presence/absence approach. Model results were evaluated based on the estimation of receiver operating characteristic (ROC) plots. The environmental factors that were considered to affect sardine habitat during the different periods of year were identified and discussed. The selected model was used subsequently to identify those regions within the entire Mediterranean basin having higher probability of supporting sardine's presence. Habitat suitability maps were produced for each year, period, and study area as well as for the entire Mediterranean basin, indicating suitable habitats for sardines. The temporal stability of these areas was also examined. The usefulness of such habitat suitability maps in environmental research and fishery management in a highly diverse environment like the Mediterranean is discussed.

Keywords: habitat suitability modelling, Mediterranean Sea, sardine, small pelagic.

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